GETTING STARTED

A Guide For New Users

8505A/ 8506A

DIGTAL MULTIMETERS

FLUKE

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DIGITAL MULTIMETERS

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CONTENTS

THIS GUIDE introduces you to the Fluke 8505A and 8506A Digital Multimeters and, gives a brief introduction to remote programming using the IEEE-488 Interface option.

This guide provides basic familiarization with the 8505A/8506A Multimeters. It is not a replacement for the Instruction Manuals of these instruments.

Refer to the description of "The Manual Set" for information on additional material.

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THE 8505A/8506A DIGITAL MULTIMETERS

The Fluke Model 8505A and 8506A DMMs provide superior measurement capabilities and performances making them suitable for calibration labs, precision bench testing, and system applications.

Features of the 8505A include:

- 5 ppm dc accuracy, 100 nV sensitivity.
- 500 readings per second with 6-1/2 digit resolution.
- AC, ohms, and current options.
- IEEE-488, RS-232-C, and parallel interface options available.
- Front to rear switchable inputs.
- Software calibration via local, or remote interfaces.
- Modular construction for application flexibility.

THE 8505A/8506A DIGITAL MULTIMETERS

Features of the 8506A include:

- 120 ppm ac accuracy, 40 Hz to 20 kHz.
- Full accuracy for crest factors as high 8:1.
- IEEE-488, RS-232-C, and parallel interface options available.
- 25 ppm short-term ac stability.
- Frequency response specified to 1 MHz.
- AC-DC transfer accuracies with DMM speed.
- Software calibration via local, or remote interfaces.

With the exception of ac measurement capabilities, the two instruments are identical. The 8506A contains a state-of-the-art thermal rms ac converter. The 8505A can make ac measurements with either the Option -01 Average Responding Module or the Option -09 RMS Converter.

SETTING UP THE 8505A/8506A

Connecting To Line Power

WARNING

TO AVOID SHOCK HAZARD, CONNECT THE INSTRUMENT POWER CORD TO A POWER RECEPTACLE WITH EARTH GROUND.

CAUTION

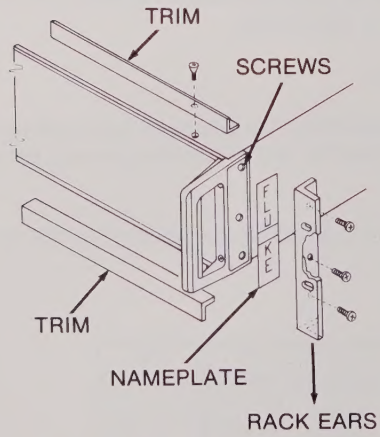
To Avoid Instrument Damage, Check To See That The Intended Line Voltage Matches The Requirement Listed On The Rear Panel Of Your Instrument (see figure below).

Refer to Section 4 of the Instruction Manual if it becomes necessary to change the line voltage.

CAUTION	SETTING SUPPLY	FUSE
FOR FIRE PROTECTION REPLACE ONLY WITH A 250V FUSE OF INDICATED VALUE.	100VAC 120VAC 220VAC 240VAC	1/2A SB 1/2A SB 1/4A SB 1/4A SB

SETTING UP THE 8505A/8506A

Rack Mounting Kits



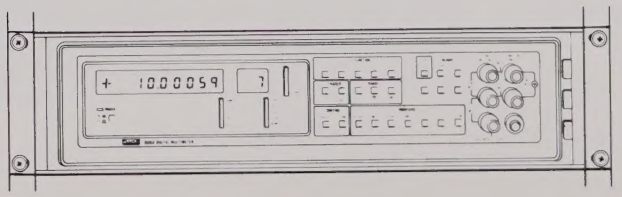
You can mount the 8505A/8506A multimeters in a standard 19-inch rack panel using the Rack Mount Adapter Kit (M04-205-600). There are also two Rack Slide Kits available for the 8505A and 8506A:

18-inch (length) Rack Slide Kit - M00-260-610

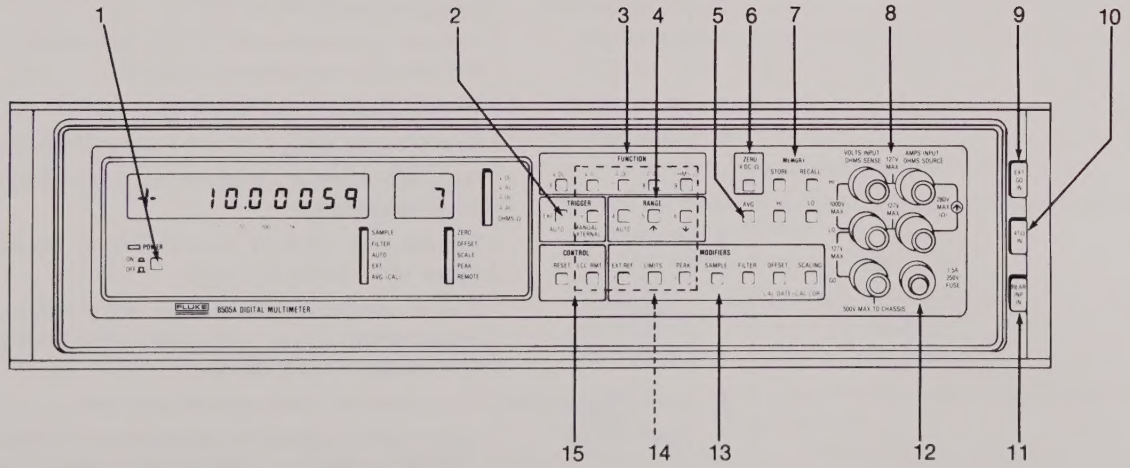
24-inch (length) Rack Slide Kit - M00-280-610

To mount the 8505A/8506A:

1. Remove the nameplate on each side.
2. Remove the screws now exposed.
3. Attach the rack ears using the screws provided in the kit.
4. Attach the metal trim using the screws provided in the kit.
5. Install the multimeter in the equipment rack.



THE FRONT PANEL



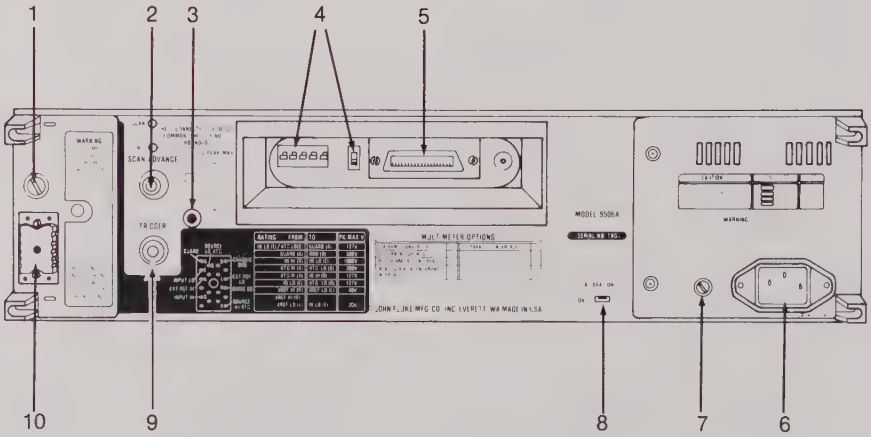
The numbered items are described on the following two pages.

THE FRONT PANEL

ITEM	NAME	DESCRIPTION
1	Power Switch	Energizes the 8505A or 8506A.
2	TRIGGER	Selects continuous (AUTO) or individual (MANUAL/EXTERNAL) measurement triggers.
3	FUNCTION	Selects measurement functions.
4	RANGE	Selects range, up (↑), down (↓), or autoranging (AUTO).
5	AVG	Toggles average mode for optimum accuracy, resolution and noise rejection.
6	ZERO	Toggles zero mode (V dc and Ω only). New zero value stored when mode is entered.
7	MEMORY	STORE used to initiate memory entry, RECALL used to recall memory value. HI/LO used when storing/recalling limit values or peak values.
8	Input Connectors	Connectors for measurement test leads.
9	EXT GD IN	Guard selector. When engaged, guard is floated to allow external connections. Connected to SENSE LO when not engaged.

ITEM	NAME	DESCRIPTION
10	4T Ω IN	Ohms selector. When engaged, allows 4-wire ohm measurements using OHMS SENSE (HI, LO) and OHMS SOURCE (HI, LO).
11	REAR INP IN	Rear input selector. When engaged, selects rear analog input connectors.
12	Fuse	Current/Ohms fuse holder, uses AGC 1.5A fuse.
13	MODIFIERS	SAMPLE selects number of samples-per-reading (N/A for V ac function of 8506A. FILTER selects the filter mode. OFFSET, SCALING, EXT REF } Mathematic operations that modify the value of the reading. LIMITS, PEAK } Special operations that modify the use of the reading.
14	Numeric Keypad	When enabled, press STORE. Numeric data can now be entered.
15	CONTROL	RESET initiates a power-up reset. LCL/RMT usage depends on type of remote interface used.

THE REAR PANEL



THE REAR PANEL

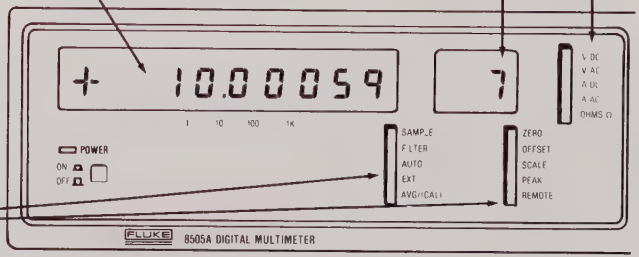
ITEM	NAME	DESCRIPTION
1	Rear Input Fuse	Fuse for Rear Analog Inputs. Use AGC 1.5A.
2	SCAN ADVANCE Output	TTL (50Ω Impedance) compatible scanner control signals.
3	Chassis Ground	Binding post for ground connections.
4	Address Switches	IEEE-488 Address (and Talk Only) selection Switches.
5	Remote Interface	Optional remote interface connector (IEEE-488 shown).
6	Power Connector	Three-prong connector for line power input.
7	Line Fuse	Line power input protection fuse.
8	CALIBRATION Switch	Enables the Calibration mode. Do not cycle power when ON.
9	External TRIGGER	Input connector for an external trigger signal.
10	Rear Analog Input	Alternate connections for Front panel inputs (switched).

THE DISPLAY

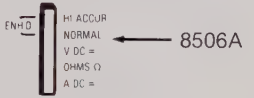
MANTISSA FIELD
5½, 6½, or
7½ digit display
with decimal point.

EXPONENT FIELD
Polarity and value
(in engineering
notation) of Mantissa.

FUNCTION ANNUNCIATORS
Annunciator(s) lights
to indicate the
selected function.



FUNCTION ANNUNCIATORS



STATUS ANNUNCIATORS

SAMPLE
flashes to show
new reading in
progress.

FILTER
lights when slow
filter is selected.

AUTO
lights for auto-
ranging.

EXT
lights when External
Reference is enabled
(disables Scaling).

AVG/(CAL)
lights (steady) when
Averaging mode is
enabled, flashes when
Calibration mode is enabled.

ZERO
lights when a zero
correction value is
used (V DC or OHMS
only).

OFFSET
Lights when Offset
mode is enabled.

SCALE
lights when Scaling
mode is enabled (disables
External Reference).

PEAK
lights when Peak
mode is enabled.

REMOTE
lights when multimeter
is controlled via the
IEEE-488 Interface.

Power-up

CAUTION

Ensure that the rear panel CALIBRATION switch is set to the OFF position before powering-up the multimeter.

Power-up Configuration

Upon power-up: The Software version is displayed as "HI - Y.Y.Y", where Y is the version in use. Hardware configuration is then displayed as "CXXXXX", where "X" signifies the installed options. The multimeter then assumes the following power-up configuration:

POWER-UP/RESET	CONDITION	DISPLAY
Function	DC Volts	V DC on
Range	1000V Manual	AUTO off
Trigger	AUTO/INTERNAL	SAMPLE flashes
Filter	F0	FILTER off
Sample	2^7 samples/reading	SAMPLE flashes
Offset	Off, Value 0	OFFSET off
Scaling	Off, Value 1	SCALE off
External Reference	Off	EXT REF off
Limits	Off, Value 0	Normal Display
Peak	Off	PEAK off
Averaging	Off	AVG/(CAL) not on steady
Zero	On, Cal Memory Values	ZERO on

MAKING MEASUREMENTS

Overload Protection Limits

WARNING

TO AVOID SHOCK HAZARD AND/OR INSTRUMENT DAMAGE, DO NOT APPLY INPUT POTENTIALS THAT EXCEED THE OVERLOAD PROTECTION LIMITS SHOWN BELOW.

INPUT OVERLOAD PROTECTION LIMITS

FUNCTION	CONNECTORS	MAXIMUM INPUT
VDC	Input HI and LO	1200V dc, 1000V rms to 60 Hz
DC, AMPS AC	Source HI and LO	1.5A ±140V dc or ac to 60 Hz
2/4 WIRE kΩ	Input HI and LO Source HI and LO	400V dc or 280V rms 400V dc or 280V rms
V AC (8505A) V AC (8506A)	Input HI and LO Input HI and LO	1000V rms or 2×10^7 Hz* 600V rms or 1×10^7 Hz*
ALL FUNCTIONS	GUARD to Chassis	500V rms

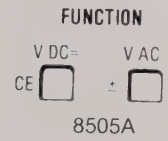
*Whichever is less

AC and DC Voltages

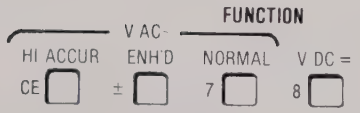
To measure ac or dc voltages, select the desired function and connect the test leads as shown.

NOTE

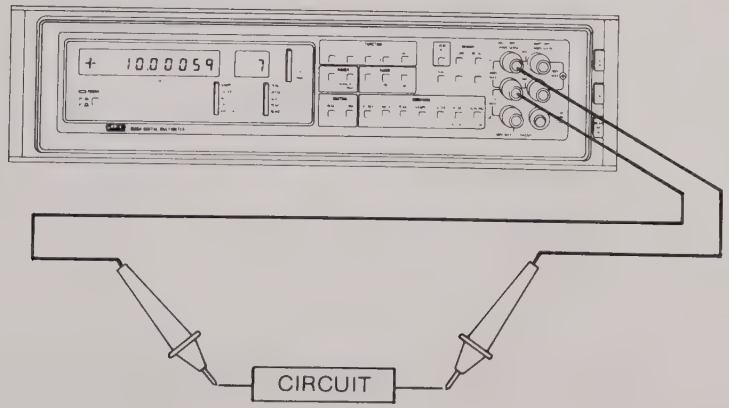
To make ac measurements with the 8505A, the Average Responding AC Coverter Option (-01) or RMS AC Converter Option (-09) must be installed.



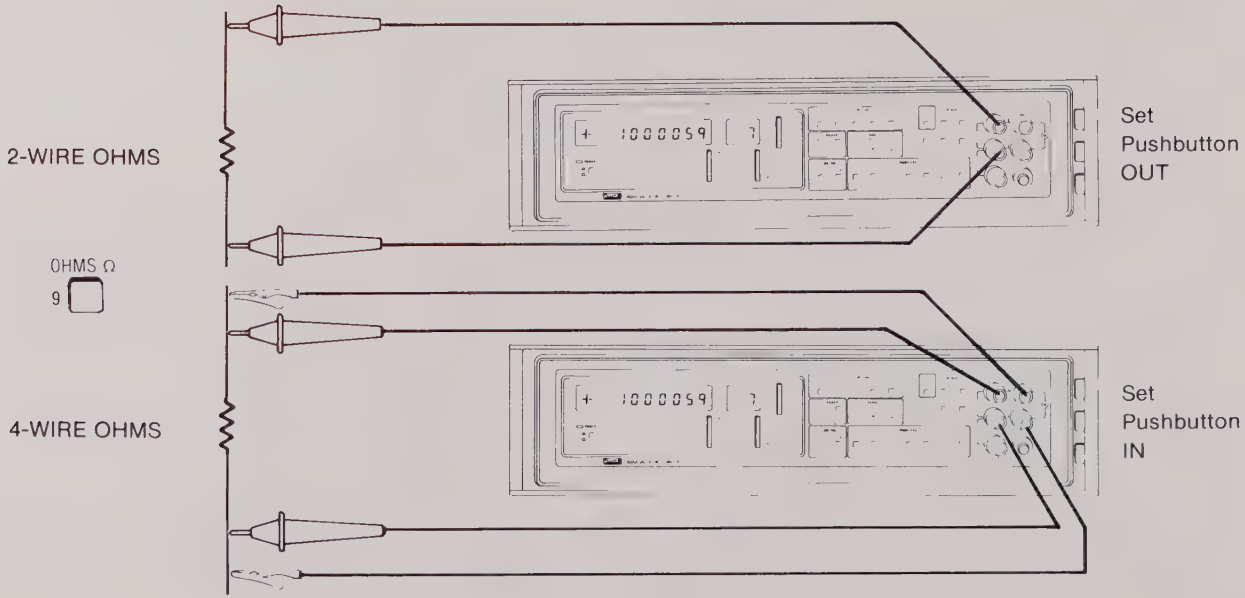
8505A



8506A



MAKING MEASUREMENTS



Resistance (Option -02)

The Option -02 measures resistance (2-wire or 4-wire ohms). To select the OHMS function, select 2-wire (4-wire Ω switch OUT) or 4-wire (4-wire Ω switch IN) and connect the test leads as shown in the illustrations on page 16.

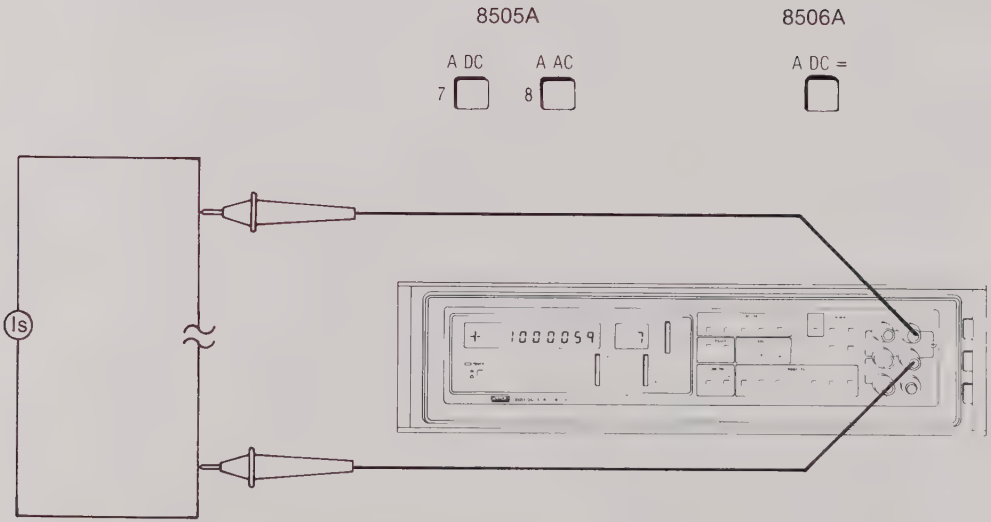
Current (Option -03)

The Option -03 Current Converter must be installed to make current measurements with the 8505A. The 8506A can make dc current measurements only with the Current Converter. To measure current, select the desired function and connect the test leads as follows:

1. Turn off the power in the circuit to be measured.
2. Break the circuit (preferably on the ground side), and place the multimeter in series at that point.
3. Turn on the power in the circuit and read the display.
4. Turn off the power in the circuit and disconnect the multimeter.

MAKING MEASUREMENTS

Current (cont.)



REMOTE OPERATION

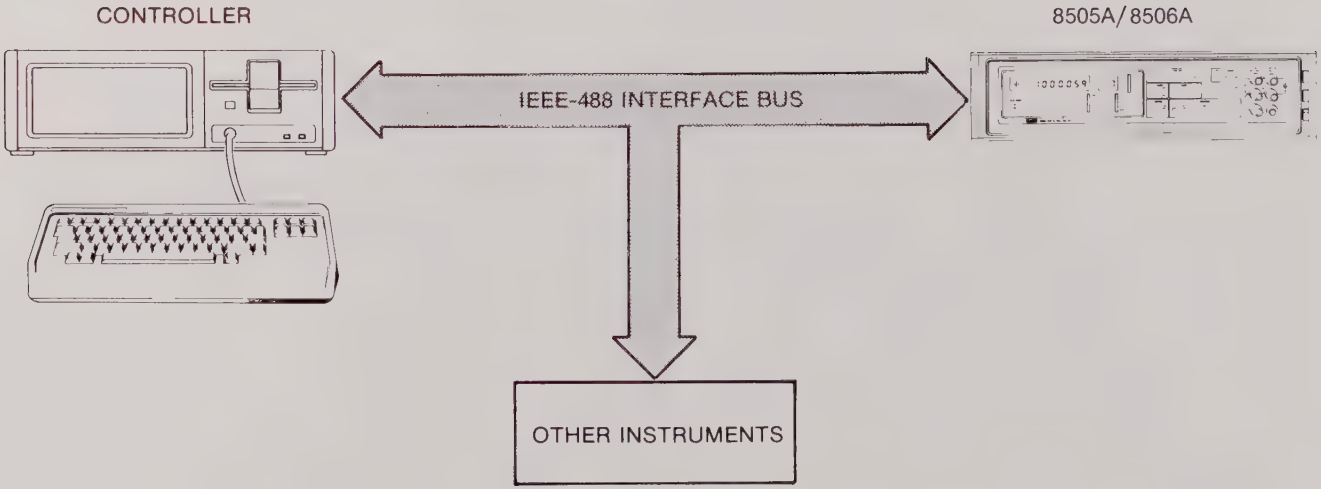
The IEEE-488 Interface

The Option -05 IEEE-488 Interface allows the multimeters to be used as a fully programmable systems instrument for operation over the IEEE-488 standard 488-1978 interface bus. The full range of measurement features are available through the IEEE-488 interface.

The 8505A/8506A can be under complete, interactive control from a remote bus controller. Or when set to talk-only mode, the multimeters can be connected to a printer or data logger and dedicated to a single task.

For an introduction to the IEEE-488 interface bus, request Fluke Application Bulletin AB-36 "IEEE Standard 488-1978 Digital Interface for Programmable Instrumentation."

REMOTE OPERATION

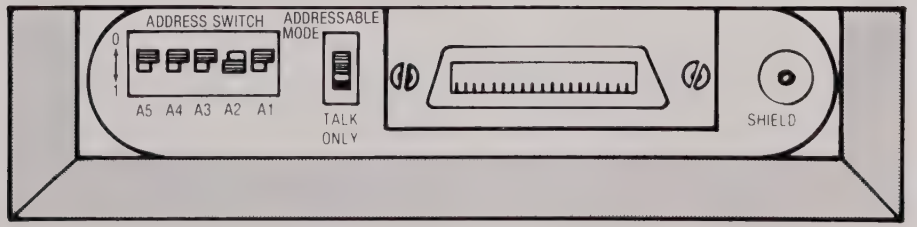


Connecting to the IEEE-488 Interface

To set up the 8505A/8506A on the IEEE-488 bus:

1. Set the 8505A/8506A address using the rear panel IEEE-488 ADDRESS switches (see figure below).
2. Connect an IEEE-488 cable into the 8505A/8506A rear panel IEEE-488 connector from one of the other instruments in the system.
3. Turn on the 8505A/8506A.

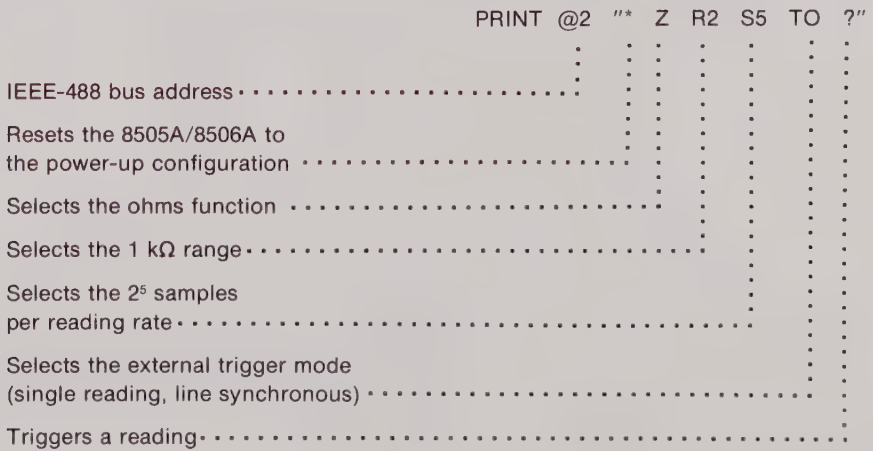
In the figure shown below, the address is set to 2 (decimal).



REMOTE OPERATION

Typical Command String

Here is a typical command string as it might be sent from a Fluke 1722A Instrument Controller. The string configures the 8505A/8506A and triggers a reading. The PRINT command automatically sends terminators (CR, LF, and/or EOI) to the 8505A/8506A at the end of the command string.


PRINT @2 "* Z R2 S5 T0 ?"
IEEE-488 bus address
Resets the 8505A/8506A to the power-up configuration
Selects the ohms function
Selects the 1 kΩ range
Selects the 2⁵ samples per reading rate
Selects the external trigger mode (single reading, line synchronous)
Triggers a reading

Programming Example

The following program was written in FLUKE BASIC for the Fluke 1722A Instrument Controller. The program assumes the 8505A/8506A ADDRESS switches are set to address 2.

```
1! THIS EXAMPLE SELECTS THE VDC (V), AUTORANGE (R), 2^5 SAMPLES PER READING
2! (S5), AND EXTERNAL TRIGGER (T0).
3! THE CONTROLLER IS A FLUKE 1722A. THE 8505A OR 8506A IS SET TO IEEE-488
4! ADDRESS 2. THE PROGRAM TRIGGERS (?) ONE READING AND THEN STOPS.
10 INIT PORT 0            ! CLEAR INTERFACE (SENDS IFC)
20 CLEAR @2               ! CLEAR DMM TO POWER-UP STATE (SENDS DCL)
30 PRINT @2, "VRS5T0?"    ! CONFIGURE AND TRIGGER DMM
40 INPUT @2, C$           ! GET DATA FROM DMM
50 PRINT C$               ! PRINT DATA ON 1722A SCREEN
60 END
```

Other Controllers

Every controller handles IEEE-488 commands somewhat differently. If you are using a controller other than the 1722A, refer to your controller's programming manual for instructions.

REMOTE OPERATION

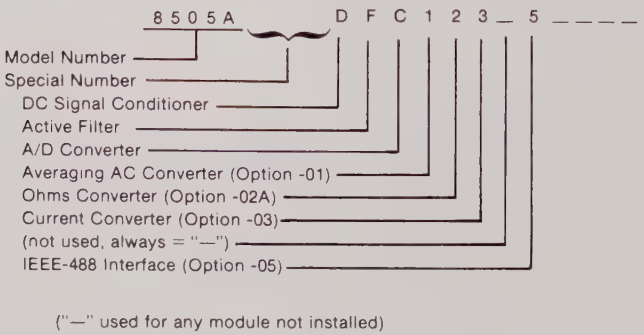
Remote Programming

An abbreviated command set is shown on the following page for commands that correspond directly to front panel operation. For complete programming instructions, refer to the 8505 or 8506 Instruction Manual.

NOTE

Additional digit returned for some ranges in Averaging Mode. For Binary Measurement Responses, refer to the 8505 or 8506 Instruction Manual.

EXAMPLE 1 Configuration Response ("G2")



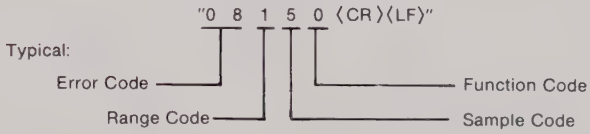
("—" used for any module not installed)

EXAMPLE 2 ASCII Measurement Respones

Always in units of volts, ohms, or amps. Typical response:

"19.26753E+3 CR LF "

EXAMPLE 3 Status Response ("G1")



Command Characters

TERMINATION CHARACTERS

,	Execute previous command string
?	Execute, trigger, and transmit reading
@	Execute and trigger — interrupt when ready

Function Commands

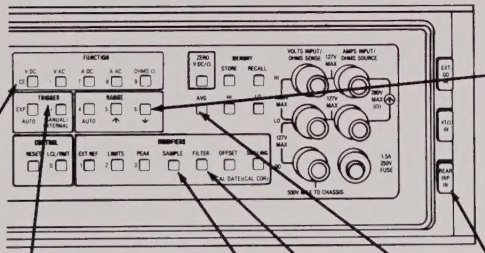
V	DC Volts
VA	AC Volts (8506A: AC Volts Normal)
C	DC Coupled AC Volts (8506A: AC+DC Normal)
I	DC Amps
IA	AC Amps (8505A only)
Z	Ohms
Z1	Fast Ohms

8506A Additional AC Volts Commands

VA1	AC Volts (Enhanced)
VA2	AC Volts (High Accuracy)
C1	DC Coupled AC Volts (Enhanced)
C2	DC Coupled AC Volts (High Accuracy)

EDIATE CHARACTERS

*** Reset**
% Halt



Range Commands

	V	VA, C (8505A)	VA/VA1/VA C/C1/C2 (8506A)	I, IA (8505A)	Z, Z1
R	Auto	Auto	Auto	Auto	Auto
R0	100 mV	Auto	100 mV	100 μA	10Ω
R1	1V	1V	300 mV	1 mA	100Ω
R2	10V	10V	1V	10 mA	1 kΩ
R3	100V	100V	3V	100 mA	10 kΩ
R4	1000V	1000V	10V	1A	100 kΩ
R5	Auto	Auto	30V	Auto	1 MΩ
R6	Auto	Auto	100V	Auto	10 MΩ
R7	Auto	Auto	500V	Auto	100 MΩ

G3 Recall input selector status ("0" = rear, "1" = front)

Trigger Commands

T	Continuous readings, line synchronized
T0	Single reading, line synchronized
T1	Continuous readings, line asynchronous
T2	Single reading, line asynchronous

Averaging Commands

O	Average mode enabled
O0	Average mode disabled

8506A AC Volts Functions: Average mode enables extended resolution only.

Samples-per-Reading Commands

S0 "S", followed by one or two digits (0-17) specifies the exponent of 2. For example, "S7" specifies 2E7, or 128,
⋮
S17 samples-per-reading

8506A AC Volts Functions: no sample commands allowed.

Filter Commands

F	Slow, no time out, FILTER light on
F0	Fast, no time out, FILTER light off
F1	Filter bypass, FILTER light off
F2	Slow, 500 ms time out, FILTER light on
F3	Fast, 50 ms time out, FILTER light off

8506A AC Volts Functions: F or F0 only allowed.

REMOTE OPERATION

Error Code Messages

Error code messages aid in identifying improper operations or, improper equipment configurations and equipment malfunctions. Most error messages indicate inappropriate operation of the multimeter, others indicate faulty modules or components in the multimeter. Refer to the 8505 or 8506 Instruction Manual for a complete list of the codes and their indications.

Momentary Error Conditions

When a momentary error condition occurs, the reading in progress is aborted, and the error code is displayed on the Mantissa Field. Multimeter operation resets automatically after the next trigger. The Function Annunciator remains on during the error condition.

Latching Error Conditions

When a latching error condition occurs, all Function Annunciators are off, and the error code is displayed on the Mantissa Field. A valid function must be selected to resume operating the multimeter.

NOTE

Refer to the Programming Card or the 8505 or 8506 Instruction Manual for a remote error code listing.

THE MANUAL SET

The 8505A Digital Multimeter is documented by the 8505A Instruction Manual (P/N 638841). The 8506A Digital Multimeter is documented by the 8506A Instruction Manual (p/n 638858).

Both of these manuals are supplemented by the Operating and Programming Card (P/N 684357). This card provides a brief explanation and reference for operating and programming the 8505A/8506A Digital Multimeters.